

CLAIMS

1. A method of processing an optical coherence tomography signal comprising:

digitizing an analog optical coherence tomography signal to provide digital data points;

5 processing the digital data points representing a portion of the signal in the time domain using non-linear regression with a sinusoidal model.

2. A method as recited in claim 1 wherein the sinusoidal model is:

$$I(t) = A \sin(2\pi f_0 t + \phi_0)$$

where  $I$  is the intensity of the optical coherence tomography signal,  $A$  is the amplitude,  $f_0$  is the frequency of the signal and  $\phi_0$  is the phase lag.

3. A method as recited in claim 1 wherein the sinusoidal model is:

$$I(t) = (A + \alpha t) \sin(2\pi(f_0 + \sigma t)t + \phi_0)$$

where  $I$  is the intensity of the optical coherence tomography signal,  $A$  is the amplitude,  $f_0$  is the frequency of the signal,  $\phi_0$  is the phase lag,  $\alpha$  models changes in amplitude and  $\sigma$  models a rate of change of frequency.

4. A method as recited in claim 1 wherein the non-linear regression is optimized for a known frequency range.

5. A method as recited in claim 1 wherein the processing determines the coefficients of the sinusoidal model including amplitude and frequency.

- 12 -

6. A method as recited in claim 5 wherein the processing eliminates components that fail to converge correctly.

7. A method as recited in claim 1 wherein the digital data points represent a portion of the signal that is less than a full cycle of a wave of the signal.

8. A method of processing an image signal representing an image of materials that are changing or moving during the imaging comprising:

5 receiving digital data points representing a portion of the image signal;

processing the digital data points in the time domain by non-linear fitting of a sinusoidal model to the digital data to determine a frequency of the signal.

9. A method as recited in claim 8 wherein the frequency of the signal is within a known frequency range.

10. A method as recited in claim 9 wherein the processing is optimized for the known frequency range.

11. A method as recited in claim 8 wherein the digital data points represent a portion of the signal that is less than a full cycle of a wave of the signal.

12. A method as recited in claim 8 wherein the sinusoidal model is

$$I(t) = A \sin (2\pi f_0 t + \phi_0)$$

- 13 -

5 where  $I$  is the intensity of the optical coherence tomography signal,  $A$  is the amplitude,  $f_0$  is the frequency of the signal and  $\phi_0$  is the phase lag.

13. A method as recited in claim 8 wherein the sinusoidal model is:

$$I(t) = (A + \alpha t) \sin(2\pi(f_0 + \sigma t)t + \phi_0)$$

5 where  $I$  is the intensity of the optical coherence tomography signal,  $A$  is the amplitude,  $f_0$  is the frequency of the signal,  $\phi_0$  is the phase lag,  $\alpha$  models changes in amplitude and  $\sigma$  models a rate of change of frequency.

14. A method as recited in claim 8 wherein the processing eliminates components that fail to converge correctly.

15. A method of processing a signal in the time domain to determine a frequency of the signal where the frequency is within a known range comprising:

5 digitizing the signal to provide digital data points; and processing the digital data points representing a portion of the signal in the time domain using non-linear regression with a sinusoidal model optimized for the known frequency range to determine parameters of the sinusoid fitting the digital data, the parameters including frequency.

16. A method as recited in claim 15 wherein the digital data points represent a portion of the signal that is less than a full cycle of a wave of the signal.

17. A method as recited in claim 15 wherein the processing eliminates components that fail to converge correctly.

18. A method as recited in claim 15 wherein the sinusoidal model is

$$I(t) = A \sin (2\pi f_0 t + \phi_0)$$

5 where  $I$  is the intensity of the optical coherence tomography signal,  $A$  is the amplitude,  $f_0$  is the frequency of the signal and  $\phi_0$  is the phase lag.

19. A method as recited in claim 15 wherein the sinusoidal model is:

$$I(t) = (A + \alpha t) \sin(2\pi(f_0 + \sigma t)t + \phi_0)$$

5 where  $I$  is the intensity of the optical coherence tomography signal,  $A$  is the amplitude,  $f_0$  is the frequency of the signal,  $\phi_0$  is the phase lag,  $\alpha$  models changes in amplitude and  $\sigma$  models a rate of change of frequency.

20. A method as recited in claim 15 wherein the parameters include amplitude and a rate of change of frequency.